Claims 12-13 over Ishida in view of Fujino et al, Mathis, Yoshiume et al and Cummins et al.

Thus, all of the prior art rejections rely upon the examiner's combination of Ishida, Fujino et al and Mathis providing a valid rejection of claim 1.

This rejection, however, presents some problems. The examiner has made it clear that he is reading the reference to Ishida such that element 46 is the first pump and element 100 the second pump. Fujino et al has been added to show a pump arrangement 32,46 that is capable of supplying a variable amount of fuel because the fuel is supplied to the common rail 24 at a variable pressure.

However, claim 1 calls for a "first fuel pump (6) for pumping a **variable pumping capacity**". Neither Ishida, with pumps 52, 46, nor Fujino et al with pumps 32, 29 meets this limitation. In both of these structures, if one tries to consider the combination of pumps to be equivalent to applicants' first pump, they do not meet the claimed limitation of the pump "pumping a variable capacity". In both of these references the combination pump pumps at a constant capacity, and a spill valve controls the pressure going to the common rail.

Clearly, this is not the same as pumping a variable capacity.

And looking at Ishida, even in view of Fujino et al, the amount of fuel which gets delivered to piston 100 by pump 46 is not by a "delivery capacity that is changed as a function of an operating condition of the engine", see the last four lines of claim 1.

The delivery capacity of the pump 46 of Ishida does not vary, that is, pump 46 is a constant volume pump which pumps a constant volume of fuel; if there is any excess fuel it is allowed to escape through spill valve 64. Thus, this portion of Ishida,

even in view of Fujino et al, does not meet the claimed limitation of "**a delivery capacity** (from first pump (6)) **that is changed as a function of an operating condition of the engine.**"

Further, the examiner has read the booster piston 100 as a pump. And while not specifically saying so, he has implied by his wording of the rejection that he considers that it would have been obvious for one skilled in the art to replace Ishida's "pump" 100 with a mechanical pump such as taught by Mathis.

This contention by the examiner is also traversed. The pressure booster 100 of Ishida and its associated structure, including the bypass 119, has functionality which would be lost with a replacement of the pressure booster by the mechanical pump of Mathis. If one were to replace the "pump" 100 of Ishida with a mechanical pump such as that of Mathis, what would one do with the bypass? With a mechanical pump, is a bypass necessary, or can one do without it? The pressure booster, bypass combination of Ishida is specifically designed so that one can deliver fuel to individual injectors at alternative pressures from a single common rail 36. Replacing the "pump" 100 of Ishida with a mechanical pump such as 4 of Mathis would destroy this critical capability of Ishida, and this capability appears to be the thrust of Ishida's entire invention.

Moreover, it is still applicants' contention that Ishida's structure 100 is not a pump, cannot be considered to be a pump, and so it would not be obvious to one skilled in the art to replace structure 100 with a mechanical pump. To be a "pump", the structure 100 of Ishida would have to have a mechanical apparatus which converts mechanical energy into fuel pressure. This is how a pump is defined on the attached page 1 of "Fluid-Power Controls" by John J. Pippenger and Richard M. Koff, published

by McGraw-Hill Book Company, Inc. in 1959.

Neither of the references to Fujino et al nor Ishida teach the very essence of applicants' invention, that a first, variable capacity pump supplies the second, main pump, according to the engine operating parameters, so that the second pump can operate to provide fuel to the injectors in precise concert with the varying needs of the engine according to the load it is under, and do so more efficiently.

None of the cited art provides the operation of a first variable pump supplying a second pump.

Applicants' inventive concept of supplying the main pump with a varying quantity of fuel from a variable first pump, eliminates any delay in supplying sufficient fuel at very low engine speeds, such as at startup; it also eliminates any oversupply of fuel at running speeds of the engine. This makes for a very efficient use of the fuel pump itself, and accordingly also it delivers the fuel at a more precise quantity.

As recited in applicants' specification on page 2, line 23 through page 3, line 15, the much quicker, and more variable adaptation of the fuel supply system of applicants' invention by making the first pump a variable pump, matches the fuel supply to the operating conditions of the engine much more precisely and more rapidly. This provides a substantially better fuel supply at the correct pressure and quantity when compared to the prior art, including that of Ishida, Fujino et al and Mathis.

The examiner has also used the references to Learman et al, Yoshiume et al, and Cummins et al in various of the rejections. But again, none of these references teach a first variable pump supplying a second pump.

The patent to Yoshiume et al teaches an electric motor driven fuel pump which

is under the control of the engine control unit 20. Via the output from engine control unit 20, the motor that drives the fuel pump is adjusted to deliver the desired quantity of fuel. But this is not the same as applicants' claimed invention. Adding this teaching to the combination of Ishida, Fujino et al and Mathis still does not make applicants' claimed invention obvious. For this combination still does not provide any teaching of supplying the second fuel pump with a varying quantity of fuel from a first variable pump, as recited in applicants' claims.

Learman et al teaches an electric motor driven fuel pump which is under the control of the engine control unit. Via the output from engine control unit, the motor that drives their fuel pump is adjusted to deliver just slightly more than the desired quantity of fuel. Again, this still is not the same as applicants' claimed invention. Nor does adding this teaching make applicants' claimed invention obvious. Adding this teaching still does not provide any teaching of supplying the second fuel pump with a varying quantity of fuel with a first variable pump, as recited in applicants' claims.

Cummins et al teaches an electric motor driven fuel pump which is under the control of the engine control unit. The output from engine control unit to the motor that drives the fuel pump is adjusted to deliver the desired quantity of fuel. But this is not the same as applicants' claimed invention, nor does adding this teaching make applicants' claimed invention obvious. Once again, this combination still does not provide any teaching of supplying the second fuel pump with a varying quantity of fuel with a first variable pump, as recited in applicants' claims.

It is therefore believed that Ishida in view of Fujino et al and Mathis, even with the addition of Learman et al, Yoshiume et al, or Cummins et al, does not teach or

make obvious the claimed subject matter.

It is noted that according to the examiner's rejection, four references are necessary to reject claims 2-6, 8-11 and 16, and five references are necessary to reject claims 12-13. While this in and of itself does not make for an invalid rejection, unless the references fit together perfectly, the use of a large number of references such as this does start to bring into question whether the rejection is a valid one. In the instance of this application, the references do not fit together with the necessary congruity to make such a multiple reference rejection, and again for this reason it is believed that the rejection of these claims should be withdrawn.

Reconsideration and allowance of the claims are courteously solicited.

Respectfully submitted,

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